Phylogeny of the Molluscan Genus Verconella, With Descriptions of New Recent and Tertiary Species

By A. W. B. POWELL, Assistant Director.

The present paper is supplementary to my Variation of the Molluscan Genus Verconella with Descriptions of New Recent Species (*Trans. N.Z. Inst.* 57, pp. 549-558). Four new Recent species, a new Recent subspecies and two Tertiary species are here described. The total of New Zealand Recent forms is now fourteen, and the fossils twenty three. In the past, alternative use of the genera *Verconella* and *Austrosipho* for New Zealand shells has caused some confusion, and now four generic names must be considered in reviewing the Austro-Neozelanic series. They are:—

Austrosipho Cossmann, 1906.
Essais Pal. Comp. 7, p. 229.
Type (o.d.): *Siphonalia roblini* Tate.
Table Cape, Tasmania (Janjukian).
Lower Miocene.

Berylsma Iredale, 1924.
P.L.S.N.S.W. 49, p. 267.
Type (o.d.): *Fusus waitei* Hedley, 1903. 79-80
fath. off Botany Bay, New South Wales.

Largisipho Iredale, 1929.
Rec. Aust. Mus. 17 (4), p. 182.
Type (o.d.): *Largisipho oligostira spectanda* Iredale, 1929.
50-60 fathoms off Montagu Is., N.S.W., Australia.

Verconella Iredale, 1914.
Proc. Malac. Soc. 11, p. 175.
Type (o.d.): *Fusus dilatatus* Quoy & Gaimard.
25 fathoms, Bay of Islands, New Zealand.

Finlay, 1927 (*Trans. N.Z. Inst.* 57, pp. 503-504), has shown that the protoconch is distinctively consistent for the two series. That is, the Australian *Austrosipho* with "a globular paucispiral protoconch, quite asymmetrically wound, the nucleus being bulbous and lateral," and the New Zealand *Verconella*, which has "a tall pupoid, polygyrate protoconch, with the nucleus small and central, the whole thing being symmetrically wound." Finlay, 1930 (*Trans. N.Z. Inst.* 61, p. 71), states also that "If genera are to express lineages, I do not see how *Largisipho* Iredale can be maintained as distinct from *Austrosipho; L. spectanda*, the genotype, is evidently a terminal Recent member of the Tertiary *roblini* line." Cotton and Godfrey, 1932 (*The South Australian Naturalist*, 13 (2), p. 75), synonymise *Largisipho* with *Berylsma*.

The genus *Berylsma* was proposed for colourless, elongate-fusiform shells from deep water off the coast of New South Wales. They are regularly axially costate and have a very even alternation of primary cords with mostly a single thread in each interspace. I have not seen the protoconch of the genotype.

One of the new species described herein, *V. fairfieldæ*, has a regular alternation of spiral sculpture and broad axial folds comparable with the *Berylsma* style of sculpture, but since this sculptural plan can be matched in a New Zealand Tertiary series, there is no reason to claim direct relationship between the New Zealand Recent *fairfieldæ* and the Australian *B. waitei*.

Since *Verconella* is now known to extend back to the Wangaloan (Danian) in New Zealand (Finlay & Marwick, 1937, N.Z. Geol. Surv. Pal. Bull. 15, p. 76) there is justification for the employment of *Verconella* generically and exclusively for the New Zealand series, leaving the evaluation of the *Austrosipho-Berylsma-Largisipho* complex as an Australian problem.

Both *Verconella* and *Austrosipho* have, throughout the Tertiary, developed independently on opposite sides of the Tasman and in each country there are recognisable groups of species. A well-marked New Zealand Miocene group, the *finlayi-marwicki* series, is characterised by the presence of strong spiral ridges on the base, one often causing angulation.

In my 1927 paper I defined two groups of the New Zealand Recent Verconellas as follows:—

> "A. **Dilatata** (typical) group.
>
> Confined to deep water. Comparatively thin shell. Operculum horny, inside with a white callus along outer margin of muscle-scar. Protoconch of three and a half to four convex whorls, always brown.
>
> "B. **Adusta** group.
>
> Littoral to comparatively deep water. Heavy shell. Operculum horny, inside always minus the white callus. Protoconch of two and a half to three whorls, only slightly convex and always white."

The New Zealand Recent and fossil *Verconellas* resolve into the following groups:—

1. proavita Finl. & Marw. 1937.

A small species with moderately strong spirals and axials. Protoconch unknown. It is the earliest known *Verconella*. Boulder Hill; Wangaloan (Danian). A new species too imperfect for description from Waihao Downs; Bortonian (Middle Eocene) is in the Finlay collection; Auckland Museum. The Waihao species is nearer to *proavita* than to any of the later groups.

PROTOCONCH TYPE B.

2. The finlayi-marwicki series.

These shells are large and solid with strong rounded peripheral nodules. On the base there are several spiral ridges much stronger than the rest and one of these often forms a basal angulation or keel. The series consists, in ascending order, of *finlayi* Laws, 1930, *marwicki* Finlay, 1930, *latispinifer* Marwick, 1932, *crawfordi* (Hutton, 1873), *masoni* and *takapauensis* Fleming, 1943, and *huttoni* King, 1934. The range is Otaian (Middle Oligocene)* to Tongaporutuan (Upper Miocene). The series terminates in very solid, strongly nodulous species representing apparently a gerontic offshoot from the main trend.

3. The clifdenensis series.

This group differs from the last in being of lighter build and in having finer surface sculpture. On the base, however, there is the same tendency to develop occasional spirals heavier than the rest. The peripheral nodules are vertically compressed. The series was probably of deep-water occurrence and the *finlayi-marwicki* series shallow-water. The finding of Upper Miocene and Lower Pliocene representatives of the "deep-water" fine-sculptured group would probably indicate that the *clifdenensis* series are ancestral to the *dilatata* series. I consider the *clifdenensis* series as an offshoot of the *finlayi-marwicki* line in its early stages of development.

The series consists of *bartrumi* Laws, 1941, *parans*, *affixa* and *clifdenensis* Finlay, 1930, and possibly *exoptatus* Bartrum & Powell, 1929. The latter species by its vertically compressed nodules, yet heavy basal keels, is probably a gerontic offshoot of the *clifdenensis* series rather than a member of the *finlayi-marwicki* series. The known range of the *clifdenensis* series is Altonian and Clifdenian (Lower Miocene).

4. The adusta series.

This series undoubtedly originated from the *finlayi-marwicki* series before the crass trend took place. The species in order of appearance are *koruahinensis* Bartrum & Powell, 1928, *haweraensis* Powell, 1931, *accipitris*, *allani* and *falsa* Finlay, 1930, *edita* Powell, 1934, and the Recent forms *adusta* (Philippi), *adusta mandarinoides* Powell, 1927, *adusta worthyæ* n. subsp., and *adpressa* n. sp. The range is Opoitian (Lower Pliocene) to Recent.

5. The mandarina series.

These shells have strong sculpture of sparse primary cords with a varying number of threads between them. The whorls are strongly convex and without either a peripheral angulation or axial sculpture. There is an undoubted member of this series in the Petane beds, Nukumaruan (Middle Pliocene); a new species more inflated than typical *mandarina*. Finlay's (1926) record of *mandarina* from the Castlecliffian refers to half-grown examples of *falsa*.

---

* Finlay, H. J. and Marwick, J., 1947. New Divisions of the New Zealand Upper Cretaceous and Tertiary. N.Z. Journ. Sci. & Tech. 28 (4), Sec. B., pp. 228-236.

6. The interjuncta-fairfieldæ series.

This is probably another offshoot from the *finlayi-marwicki* series or alternatively from earlier stock which gave rise to both. They are characterised by regular sculpture of broad low spiral cords with a single thread in each interspace. The species are the Awamoan (Upper Oligocene) *imperfecta, interjuncta* Finlay, 1930, *asper* Marwick, 1928, and the Recent *fairfieldæ* n. sp.

PROTOCONCH TYPE A.

These are all large, deep-water shells of thin build and fine spiral sculpture. There are three groups, (1) the *ormesi* series characterised by evenly convex whorls without nodules; (2) the *dilatata* series, broad forms with strong vertically compressed peripheral tubercles; and (3) the *elongata* series, forms similar to the last, but narrow and elongate.

7. The ormesi series.

The earliest record is *Verconella ormesi* Powell (Marwick, 1931, N.Z. Geol. Surv. Pal. Bull. 13, p. 40), from Tutamoe Beds (Middle Miocene). The series includes a new species from Nukumaru (Middle Pliocene), juveniles of a species allied to if not identical with *ormesi*, from Castlecliff (Upper Pliocene), and two Recent species, typical *ormesi* Powell, 1927, and *chathamensis* Powell, 1938.

8. The dilatata series.

The only known fossil occurrence of this series is *dilatata* typical from uppermost Castlecliffian beds at Te Piki, near Cape Runaway. Powell, 1934 (Rec. Auck. Inst. Mus. 1, p. 264). The species are *dilatata* (Quoy & Gaimard, 1833), *dilatata cuvieriana* and *d. rotunda* Powell, 1927, and *dispar* n. sp.

9. The elongata series.

The earliest known occurrence of this series is *hiatula* n. sp. from the Nukumara blue clays and the lower Kai Iwi blue clays, Nukumaruan to Lower Castlecliffian (Middle and lower beds of the Upper Pliocene). The Recent members are *elongata* Powell, 1927, and *jeakingsi* n. sp.

COMPARATIVE ANALYSIS OF SPIRAL SCULPTURE.

The spiral sculpture in the Verconellids is difficult to describe, for there is not only a fair amount of individual variation in the strength, number and arrangement of the cords and threads, but also the sculpture varies from whorl to whorl in any one shell. The tendency is for the primaries to become sparse with an increasing number of interstitial threads as the whorls increase.

The following table is a comparative evaluation of the spiral sculptural detail in six of the species discussed herein. The formulæ show the number of primary and secondary spirals per centimeter for the lower spire whorls (" S-W,") ; and the same for the upper part of the body-whorl (" B-W.").

GROUP A (Typical protoconch).

dilatata

Spiral sculpture almost uniformly fine; primary spirals only slightly stronger than secondaries.

S-W. 13-14 primaries + 1-3 intermediates = 18-25 spirals.

B-W. 4-9 primaries + 3-4 intermediates = 13-20 spirals.

dispar n. sp.

Spiral sculpture of broad low cords and a varying number of much narrower intermediates.

S-W. 7-8 primaries + 2-3 intermediates = 23-24 spirals.

B-W. 5-6 primaries + 2-4 intermediates = 17-22 spirals.

GROUP B protoconch.

adusta

Spiral sculpture irregular, consisting of rather distant moderately strong cords with a median subsidiary cord in most interspaces and fine threads in varying numbers on either side of it.

S-W. 6-8 primaries + 1-8 intermediates = 23-31 spirals.

B-W. 3-4 primaries + 2-8 intermediates = 20-27 spirals.

mandarina

Spiral sculpture consisting of a few heavy primary cords and much weaker intermediate threads.

S-W. 4-6 primaries + 1-3 intermediates = 10-12 spirals.

B-W. 3-4 primaries + 1-4 intermediates = 8-10 spirals.

adpressa n. sp.

Spiral sculpture rather weak, consisting of irregular cords and a varying number of intermediate threads.

S-W. 7-8 primaries + 1-3 intermediates = 16-19 spirals.

B-W. 4-6 primaries + 1-3 intermediates = 18-19 spirals.

fairfieldæ n. sp.

Spiral sculpture of broadly rounded cords with a single thread in each interspace.

S-W. 6-7 primaries + 1 intermediate = 11-13 spirals.

B-W. 3-4 primaries + 1 intermediate = 7-11 spirals

Verconella dispar n. sp. Pl. 18, fig. 3.

A member of the typical (*dilatata*) series, characterized by a lower peripheral angulation and distinctive sculpture.

Spire angle 58 degrees. Aperture + canal 1.468 times height of spire. Adult whorls 7, plus a typical protoconch of four whorls. Peripheral angle just below the lower third of the whorl height. The angle is defined by a broad smooth spiral cord and is without nodules except for the first 3-4 post-nuclear whorls, which have weak axial folds, about 10 per whorl. The angulation almost disappears over the last half whorl and is strongest on the antepenultimate and penultimate. Surface sculpture of broad low smooth slightly convex primary cords and a varying number of much narrower intermediates. On the later spire-whorls the primaries number 7-8 per centimeter with from 2-3 threads in each interspace, making a total of from 23-24 spirals per centimeter. On the base the primaries are 5-6 per centimeter, the intermediates 2-4, and the total, 17 to 22 spirals per centimeter. The aperture has a heavier callus than usual for the group, resulting in a raised callus plate over the parietal wall and a distinct varix within the outer lip. This varix is distinctly spirally lirate. Colour buff to pale-brown; aperture and apertural callus dull white. The free parietal callus and outer-lip varix, coupled with stronger sculpture than usual for the *dilatata* series, place *dispar* nearest to *rotunda* Powell, 1927. In *rotunda* the angulation is median, nodulous throughout, and the spiral sculpture is crossed by dense axial growth threads.

Height, 155 mm.; diameter, 68 mm.

Locality: Off Cape Campbell, Marlborough, 30-40 fathoms. Trawler "Futurist," 1925.

Holotype: In the writer's collection, Auckland Museum. The only known specimen.

Verconella hiatula n. sp. Pl. 17, fig. 3.

The first known member of the *elongata* series. It differs from all other species in having the middle whorls devoid of axials. Spire angle 45 degrees. Aperture + canal 1.308 times height of spire. Adult whorls 8; protoconch missing. Periphery situated from below the middle to the lower third of whorl height, bluntly angled on the whorls bearing axials but narrowly rounded on those devoid of axials. First four post-nuclear whorls with fold-like axials, next three whorls including the penultimate without axials, body-whorl with eight blunt slightly vertically compressed prominent nodules. The shoulder is broadly but distinctly concave, and descends at an angle of 145 degrees to the axis of the shell. Surface sculpture fine of approximately evenly developed threads, 25-28 per centimeter. Three to five slightly stronger spirals traverse the peripheral nodules. Aperture finely lirate within the slightly thickened outer lip.

Height, 125 mm.; diameter, 56 mm.

Locality: Lower Kai Iwi blue clays, sea-cliffs between Kai Iwi and Okehu. Lower Castlecliffian (Upper Pliocene). Collected A.W.B.P., Jan., 1927. Nukumaru blue clay, Nukumaruan (Middle Pliocene).

Holotype: In writer's collection, Auckland Museum.

The Nukumaruan record is based upon Finlay's paratype of *V. allani* Finlay, 1930 (Trans. N.Z. Inst. 61, p. 71). The holotype of *allani* is, as stated by Finlay, a relative of the Castlecliffian *falsa* and is probably directly ancestral to it. These shells belong to the *adusta* series, for they are more coarsely sculptured and have a greater spire angle than the *elongata* series.

PLATE 17.

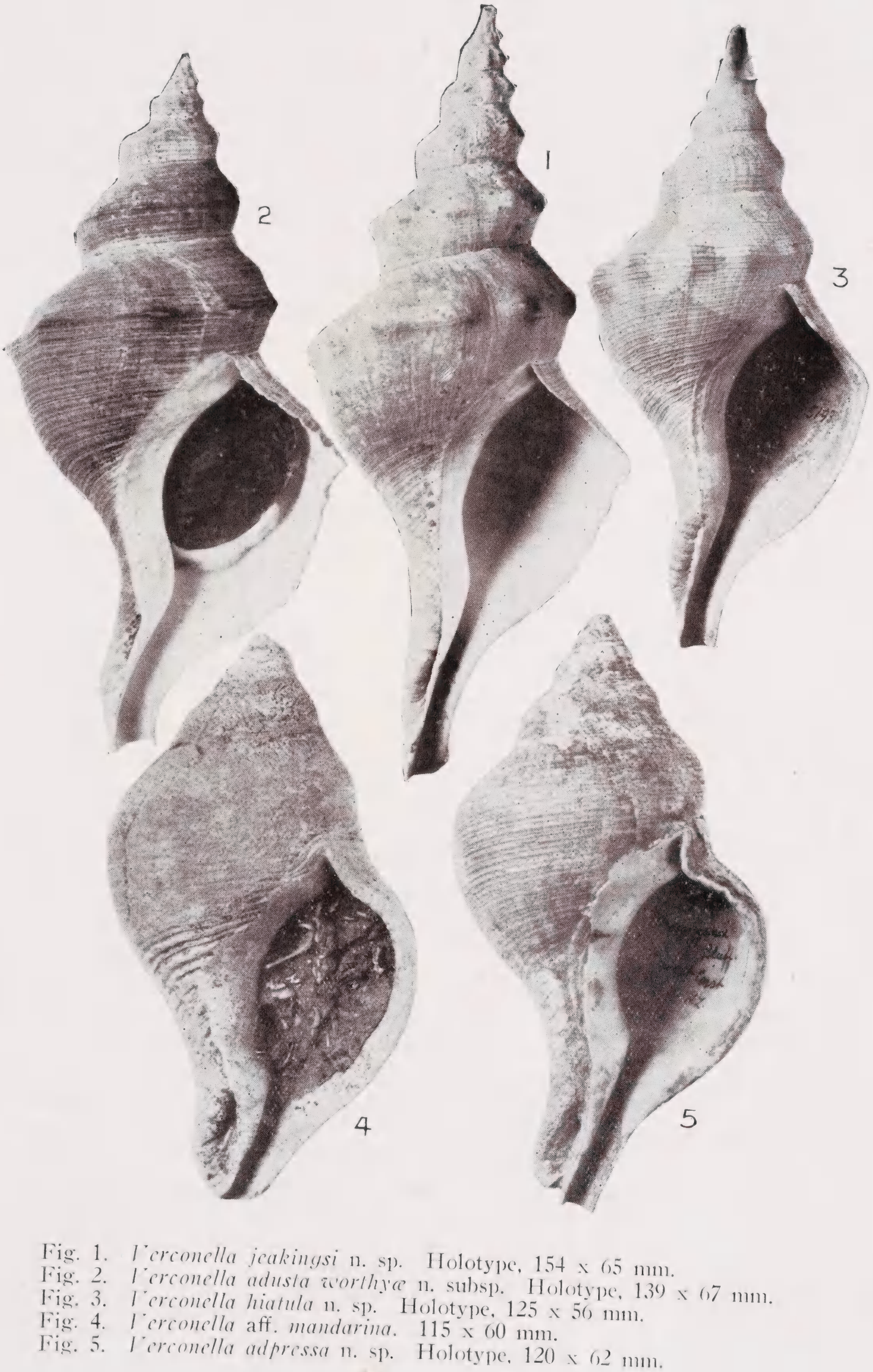


Fig. 1. *Verconella jeakingsi* n. sp. Holotype, 154 x 65 mm.
Fig. 2. *Verconella adusta worthyæ* n. subsp. Holotype, 139 x 67 mm.
Fig. 3. *Verconella hiatula* n. sp. Holotype, 125 x 56 mm.
Fig. 4. *Verconella* aff. *mandarina*. 115 x 60 mm.
Fig. 5. *Verconella adpressa* n. sp. Holotype, 120 x 62 mm.

Verconella jeakingsi n. sp. Pl. 17, fig. 1.

A second Recent member of the *elongata* series characterized by its narrow form, attenuated spire, bluntly rounded peripheral nodules and exceedingly fine, crowded and evenly developed spiral-thread sculpture. Spire angle 30-35 degrees. Aperture + canal 1.185 times height of spire (i.e., apex to top of aperture). Adult whorls 8, plus a typical protoconch of 3½ whorls (damaged in holotype). Peripheral angle at the middle, bearing prominent bluntly-rounded nodules, 10 on the penultimate. Shoulder descending at 130° to the axis of the shell. Surface sculpture finely and evenly developed, 20-25 threads per centimeter on middle whorls. Weak primaries occur below the periphery and become distant over the lower part of the base. Colour buff diffused with pale orange-brown. Apertural callus pinkish-white, outer-lip margined within by diffused orange-brown.

The species is nearest allied to *elongata* from 19 fathoms off Whale Island, Bay of Plenty. In *elongata* the spire-angle is 45-50 degrees, the aperture + canal 1.519 times height of spire, and the shoulder descends at about 150° to the axis of the shell. Briefly, *jeakingsi* in proportions differs from *elongata* in having the spire narrower, but the body-whorl more inflated.

Height, 154 mm.; diameter, 65 mm.

Locality: Trawled in Cook Strait, probably Tasman Bay, Nelson, Mr. Jeakings, per Mrs. I. Worthy.

Holotype: In Auckland Museum, presented by Mrs. I. Worthy. Paratypes in Mrs. Worthy's collection.

Verconella adusta worthyæ n. subsp. Pl. 17, fig. 2.

A south Cookian member of the *adusta* series which stands nearest to the Bay of Plenty *adusta mandarinoides.* In typical *adusta* the whorls are strongly keeled and nodulous throughout; in *adusta mandarinoides.* axial folds, nodules, and a weak peripheral keel are present on the early whorls but the latter half of the penultimate and the body-whorl are strongly and evenly convex, weakly subangled at most, and always devoid of nodules. In *adusta worthyæ* the first two or three post-nuclear whorls are rounded and weakly axially costate; the following two whorls are rounded and entirely without nodules, but the penultimate and the body-whorl have a peripheral keel which bears distant vertically compressed nodules commencing early on the penultimate and terminating half a whorl back from the aperture. The nodules number nine per whorl. Spire angle 55°, aperture + canal 1.366 times height of spire. Adult whorls 6, plus a typical *"adusta-type"* protoconch of 2½ whorls. Spiral sculpture irregular, consisting of rather distant moderately strong cords with a median subsidiary cord and a varying number of fine threads in each interspace. Primary cords 4 to 8 per centimeter; interstices mostly with a subsidiary cord and 2 to 4 threads: total number of spirals per centimeter varying between 15 and 21. Colour buff, stained with pale reddish-brown; apertural callus white.

Height, 139 mm.; diameter, 67 mm.

Locality: Trawled in Cook Strait, probably Tasman Bay, Nelson. Mr. Jeakings, per Mrs. I. Worthy.

Holotype: In Auckland Museum, presented by Mrs. I. Worthy. Paratypes in Mrs. Worthy's collection.

Verconella adpressa n. sp. Pl. 17, fig. 5.

A member of the *adusta* series, nearest to *adusta mandarinoides*. The species is characterised by a complete absence of axials and a deeply concave shoulder, resulting in an adpressed suture and a constricted anterior canal. Shell broadly fusiform with inflated whorls, evenly convex except for the shoulder concavity. Spire angle 70 degrees. Aperture + canal 1.460 times height of spire. Adult whorls 5 (apex missing). Surface sculpture rather weak, consisting of irregular cords and a varying number of intermediate threads. The spire-whorls have 7-8 primary cords per centimeter and the body-whorl 4-6 per centimeter. The intermediates vary between 1 and 3. Parietal callus heavy, with a raised edge and a spiral ridge-callus, scarcely a tubercle, which combined with the insinuation of the outer lip over the shoulder causes a considerable constriction of the anterior canal. Outer lip thickened within and weakly lirate. The apparent false-umbilicus associated with the posterior canal is adventitious, having been caused by vertical borings up from the base of the pillar. The anterior canal has been forced 7 mm. from its axis to avoid the borings, which consist of four 3 mm. diameter holes. Colour buff with the spiral sculpture lined in light reddish-brown. Interior of aperture and apertural callus dull white.

Height, 120 mm. (estimated); diameter, 62 mm.

Locality: Off Maunganui Bluff, West coast of North Auckland Peninsula, 50 fathoms.

Holotype: In the writer's collection, one of three specimens obtained from a local trawler by the late Dr. E. N. Drier in 1927. The other two specimens should be in the Drier collection, Vancouver Museum.

Verconella aff. mandarina n. sp.? Pl. 17, fig. 4.

This is the only undoubted fossil member of the *mandarina* series known to the writer. It is probably a new species, for it is much shorter and broader than Recent shells. Unfortunately almost all the surface sculpture has been defaced, so description is withheld pending the finding of better material.

Height, 115 mm. (estimated); diameter, 60 mm.

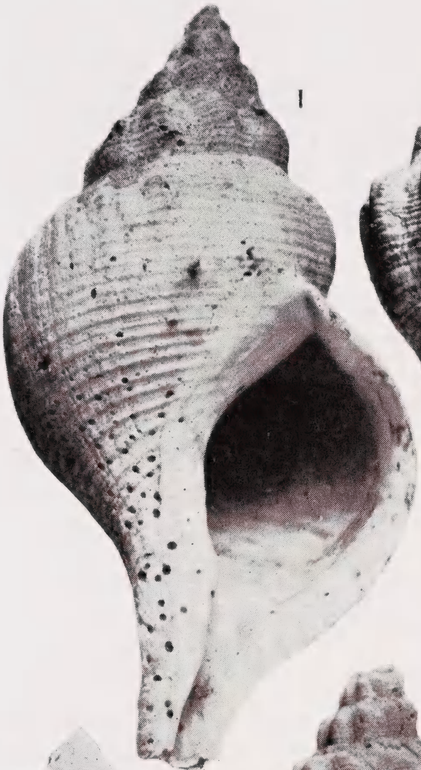
Locality: Petane beds, Hawke's Bay. Nukumaruan (Middle Pliocene). N.Z. Geological Survey, Wellington.

Verconella imperfecta n. sp. Pl. 18, figs. 6 and 7.

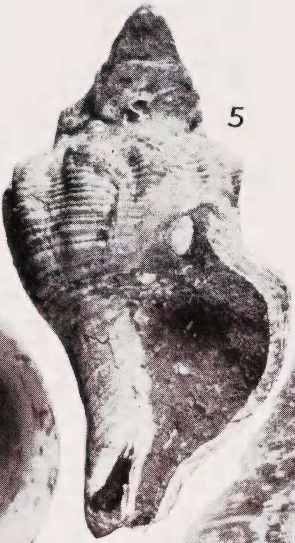
Shell broadly fusiform with a deeply concave shoulder. Periphery narrowly rounded and situated just below the middle of whorl height. Sculptured with broad fold-like axials 11-12 per whorl, extending from suture to suture but very weak over the shoulder. Surface sculpture of broadly rounded smooth spiral cords mostly with a single thread in each interspace. The cords number 10-11 on the spire whorls and there are from 8-10 per centimeter. On the base they are about 6 per centimeter. Spire angle 70 degrees.

Height, 85 mm. (estimated); diameter, 44 mm. (estimated).

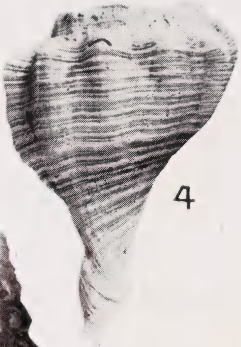
Localities: Awamoa (holotype), near Oamaru. Awamoan (Upper Oligocene); Pareora, Otaian (Middle Oligocene). N.Z. Geological Survey Collection



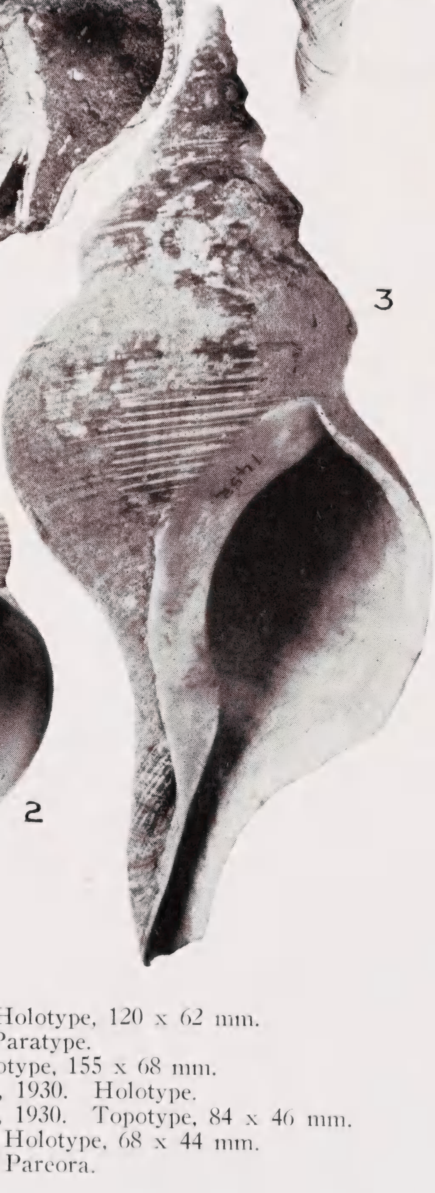
1



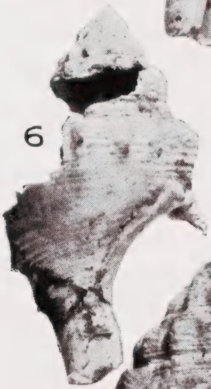
5



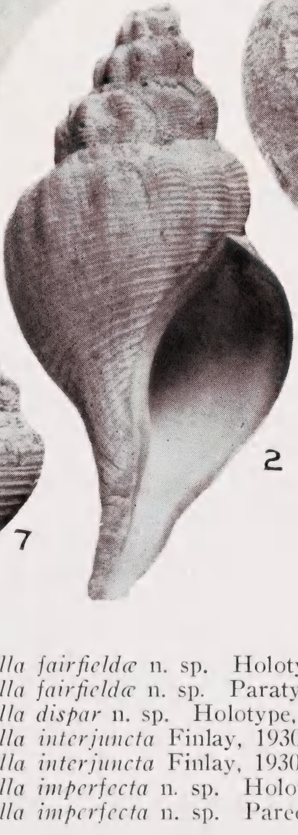
4



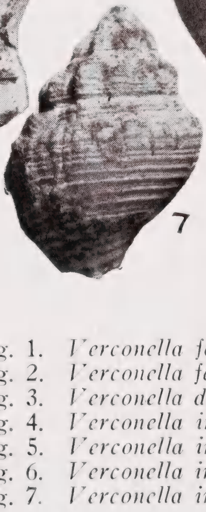
3



6



2



7

Fig. 1. *Verconella fairfieldæ* n. sp. Holotype, 120 x 62 mm.
Fig. 2. *Verconella fairfieldæ* n. sp. Paratype.
Fig. 3. *Verconella dispar* n. sp. Holotype, 155 x 68 mm.
Fig. 4. *Verconella interjuncta* Finlay, 1930. Holotype.
Fig. 5. *Verconella interjuncta* Finlay, 1930. Topotype, 84 x 46 mm.
Fig. 6. *Verconella imperfecta* n. sp. Holotype, 68 x 44 mm.
Fig. 7. *Verconella imperfecta* n. sp. Pareora.

Holotype: In N.Z. Geological Survey, Wellington. The material upon which *imperfecta* is based is very imperfect, but since it is apparently the earliest member of a line which has survived to Recent times the naming of the species seems to be warranted.

For comparison I provide figures of the holotype (Pl. 18, fig. 4) and a topotype (Pl. 18, fig. 5) of *V. interjuncta* Finlay, 1930 (Trans. N.Z. Inst. 61, p. 68), since the species has not been figured previously.

Verconella fairfieldæ n. sp. Pl. 18, figs. 1 and 2.

Broadly fusiform with strongly convex whorls; not keeled or angled at the periphery, but there is a marked subsutural concavity occupying the upper third of the whorl height. Spire angle 70 degrees. Aperture + canal 1.442 times height of spire. Sculptured with broadly rounded prominent axial folds, extending from suture to suture, but weak over the subsutural concavity. Axials 10-11 per whorl, subobsolete to obsolete over the body-whorl. Surface regularly sculptured with broadly-rounded slightly raised spiral cords, with a single thread in each interspace, except for a narrow zone immediately below the suture where there are no interstitials, and the lower part of the base where the interstitials increase to three. There are 18 spiral cords on the penultimate, the uppermost five being closely spaced and without interstitial threads. The protoconch is missing in the three known examples. Colour pale buff; apertural callus and interior of aperture dull white.

Height, 120 mm. (estimated); diameter, 62 mm. (holotype).

Height, 158 mm. (estimated); diameter, 70 mm. (paratype).

Locality: Trawled off eastern coast of Otago.

Holotype: Presented by Mrs. M. E. Fairfield, in Auckland Museum. Paratype in Mrs. Fairfield's collection.

This species does not belong to the *adusta* group, but is evidently a surviving member of a Tertiary line represented by the Otaian-Awamoan (Middle and Upper Oligocene) *imperfecta* n. sp., *Verconella interjuncta* Finlay, 1930, from Clifden (band 8A) Waiauan (Middle Miocene) and *V. asper* Marwick, 1928, from Flower Pot Harbour, Chatham Islands, Opoitian? (Lower Pliocene). They differ from all other members of the genus in the regularity of the sculpture, which consists of prominent broadly rounded primary spiral cords with a single thread in each interspace and broad fold-like axials extending from the lower suture to above the periphery, but weak on the concave shoulder.

The only related group with similar regular sculpture is the benthic New South Wales *Berylsma*, but these shells are more elongate-fusiform with a long canal and according to Cotton & Godfrey, 1932 (South Aust. Naturalist 13, (2), p. 75), have a few-whorled globular smooth protoconch. The protoconch in a juvenile paratype of *interjuncta* is of three smooth whorls and in shape is nearest to that of *adusta*.